National Climatic Data Center

DATA DOCUMENTATION

FOR

DATA SET 9641C (DSI-9641C)

**MONTHLY STATION NORMALS OF TEMPERATURE,
PRECIPITATION, AND DEGREE DAYS, AND
PRECIPITATION PROBABILITIES AND QUINTILES: 1971 - 2000**

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National Climatic Data Center
151 Patton Ave.
Asheville, NC 28801-5001 USA

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Table of Contents

1. **Abstract**: The climatological normals presented in this publication are based on monthly maximum, minimum, and mean temperature and monthly total precipitation records for each year in the 30-year period 1971-2000, inclusive. Most stations were operating as of December 2000. In order to be included in the normals, a station had to have at least 10 years of monthly temperature data or 10 years of monthly precipitation data for each month in the period 1971-2000. In addition, a station had to be active since January 1, 1999 OR had to be included as a normals station in the 1961-1990 normals.

In 1989, the World Meteorological Organization (WMO) prescribed standards of data completeness for stations that were subsequently included in the 1961-1990 WMO Standard Normals (WMO, 1989). For full qualification, the thirty-year month-year sequential file had to have no more than three consecutive year-month values missing for a given month or no more than five overall values missing for a given month. Less than fully qualified stations were included in the standard normals if they had a minimum of 10 year-month values for each month. The requirement for a minimum of 10 years of monthly data in the 1971-2000 period assures that all stations minimally meet standard normals requirements articulated by WMO. Out of 7937 stations included in the 1971-2000 normals, approximately 5200 are fully qualified under the WMO guidelines, with the remaining meeting minimal requirements (except for selected supplemental ASOS stations).

Several adjustments were made to the data before the normals were calculated. These adjustments include estimating missing data, adjusting for time of observation bias, and adjusting for inhomogeneities.

Units used in this publication are degrees F for temperature and inches for precipitation. Heating and cooling degree day (base: 65 degrees F) normals are derived from the monthly normal temperatures using a modification of the technique developed by Thom (1954a, 1954b, 1966), or are computed directly from daily degree day values. Degree day normals have also been computed to other bases and are available in *Climatography of the United States, No. 81, Supplement No. 2* (Annual Degree Days to Selected Bases, 1971-2000) or in digital data set DOC/DSI-9641-G.

1971-2000 MONTHLY STATION NORMALS

First-Order Stations: First-order stations record hourly observations and are usually staffed by professional observers. They can often be identified as having WSO, WFO, WSFO, WSMO, WSCMO, FAA, or AP (for Airport) in their name. For all first-order stations, any missing data for the 1971-2000 period were estimated from the monthly values of neighboring stations. Time of observation adjustments were made, as necessary, to the data from the neighboring stations before these data were used to estimate the missing first-order station data (Karl, et al., 1986). Exposure change adjustments (Karl and Williams, 1987) were made to first-order stations in the conterminous U.S., but not to the stations in Alaska, Hawaii, or U.S. possessions because of the lack of a sufficient number of neighboring stations. The neighboring stations used in the adjustment procedure included

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non-first-order stations from the Cooperative Station Network.

Cooperative Stations: 'Cooperative Stations', in this context, refers to stations not part of the first-order network. These stations usually record daily data only and are usually operated by volunteer observers. For all cooperative stations, any missing data for the 1971-2000 period were estimated from the monthly values of neighboring first-order and cooperative stations. Time of observation adjustments were made to those stations in the conterminous U.S. that did not conform to a midnight-to-midnight observation schedule. No adjustments were made to stations in Alaska, Hawaii, or U.S. possessions because of the lack of a sufficient number of neighboring stations. No exposure change adjustments were made based solely on the station history information, because a cooperative station's identity changes (according to National Weather Service standards) when significant moves occur (generally at least 5 miles or 100 feet in elevation, subject to the judgment of the National Weather Service Cooperative Program Manager).

Methodology: A climate normal is defined, by convention, as the arithmetic mean of a climatological element computed over three consecutive decades (WMO, 1989). Ideally, the data record for such a 30-year period should be free of any inconsistencies in observational practices (e.g., changes in station location, instrumentation, time of observation, etc.) and be serially complete (i.e., no missing values). When present, inconsistencies can lead to a non-climatic bias in one period of a station's record relative to another. In that case, the data record is said to be "inhomogeneous". Since records are frequently characterized by data inhomogeneities, statistical methods have been developed to identify and account for these data inhomogeneities. In the application of these methods, adjustments are made so that earlier periods in the data record more closely conform to the most recent period. Likewise, techniques have been developed to estimate values for missing observations. After such adjustments are made, the climate record is said to be "homogeneous" and serially complete. The climate normal can then be calculated simply as the average of the 30 values for each month observed over a normals period like 1971 to 2000. By using appropriately adjusted data records, where necessary, the 30-year mean value will more closely reflect the actual average climatic conditions at all stations.

The methodology used to address inhomogeneity and missing data value problems stations is comprised of several steps. As with all automated quality control and statistical adjustment techniques, only those data errors and inhomogeneities falling outside defined statistical limits can be identified and appropriately addressed. In addition, even the best procedures can occasionally apply corrections where none are required or misidentify the exact year of a discontinuity. In the 1971-2000 monthly normals calculations, the sequential year-month data were adjusted to conform to a common midnight-to-midnight observation schedule. This is necessary since changes in observation time also can lead to non-climatic biases in a station's record. The data were then quality controlled to identify suspect observations and missing or erroneous values were estimated. Finally, the serially complete data series were adjusted for non-climatic inhomogeneities.

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In the 1971-2000 normals, all stations were processed through the same procedures, whereas in the 1961-1990 normals only NWS First-order stations were evaluated for inhomogeneities.

In order to effectively compare records among various stations, the time of observation bias, if present, must be removed. While the practice at all NWS First-order stations is to use the calendar day (midnight recording time) for daily summaries, Cooperative Network Station observers record observations once per day summarizing the preceding 24-hour period ending generally in the local morning or evening hours. Observations based on observation times other than midnight can exhibit a bias relative to those based on a midnight observation time (see e.g., Baker, 1975). Moreover, observation times at any one station may change during a station’s history resulting in a potential inhomogeneity at that station. To produce records that reflect a consistent observational schedule, the technique developed by Karl et al. (1986) was used to adjust the monthly maximum and minimum temperature observations to conform to observations recorded on a midnight-to-midnight schedule. However, no time of observation bias adjustments were applied to stations in Alaska, Hawaii, or the U.S. possessions since no model for adjustment presently exists for these regions.

All monthly temperature averages and precipitation totals were cross-checked against archived daily observations to ensure internal consistency. In addition, each monthly observation was evaluated using an adaptation of the quality control procedures described by Peterson et al. (1998). In this approach, observations at each station are expressed as a departure from the long-term monthly mean. Then, monthly anomalies at a candidate station are compared with the anomalies observed at neighboring stations. Where anomalies at the candidate disagree substantially with those of its neighbors, the observations at the candidate are flagged as suspect and an estimate for the candidate is calculated from neighboring observations. If the original observation and the estimate differ by a wide margin (standardized using the observed frequency distribution at the station), the original is discarded in favor of the estimate. Very few observations were eliminated based on the quality control evaluation.

To produce a serially complete data set, missing or discarded temperature and precipitation observations were replaced using the observed relationship between a candidate’s monthly observations and those of up to 20 neighboring stations whose observations exhibited the highest correlation with those at the candidate site. Monthly estimates are calculated using the climatological relationship between candidate and neighbor as well as a weighting function based on the neighbor’s correlation with the candidate. For temperature estimates, neighboring stations were drawn from the pool of stations found in the U.S. Historical Climatology Network (USHCN; Karl et al. 1990) whereas for precipitation estimates, all available stations were potentially used as neighbors in order to maximize station density for estimating the more spatially variable precipitation values.

Peterson and Easterling (1994) and Easterling and Peterson (1995) outline the method that was used to adjust for temperature inhomogeneities. This technique involves comparing the record of the candidate station with a reference series generated from neighboring data. The reference series is reconstructed using a weighted average of first difference observations (the difference from one year to the next) for neighboring stations with the with the highest correlation with the candidate. The underlying assumption behind this methodology is that temperatures over a region have similar tendencies in variation. For example, a cold winter followed by a warm winter usually occurs simultaneously for a candidate and its neighbors. If this assumption is violated, the potential discontinuity is evaluated for statistical significance. Where significant discontinuities are detected, the difference in average annual temperatures before and after the inhomogeneity is applied to adjust the mean of the earlier block with the mean of the latter block of data. Such an evaluation requires a minimum of five years between discontinuities. Consequently, if multiple changes occur within five years or if a change occurs very near the end of the normals period (e.g. after 1995), the discontinuity may not be detectable using this methodology.

The methodology employed to generate the 1971-2000 normals is not the same as in previous normals calculations. For example, in the calculation of the 1961-1990 normals no attempt was made to adjust Cooperative Network observer data records for inhomogeneities other than those associated with the time of observation bias. Therefore, serial year-monthly data for overlapping periods between normals (e.g., for the 20 years in common between the 1961-90 and 1971-2000 normals) will not necessarily be identical.

Degree Day Normals

Degree day normals were computed in two ways. For 250 selected NWS first-order locations, heating and cooling degree day normals were computed directly from daily values for the 1971-2000 period. For all other stations, the rational conversion formulae developed by Thom (1954, 1966) was modified by using a daily spline-fit assessment of mean and standard deviations of average temperature. The Thom methodology allows the adjusted mean temperature normals and their standard deviations to be converted to degree day normals with uniform consistency. The modification eliminates an artificial month-by-month 'step' in the data output. In some cases this procedure will yield a small number of degree days for months when degree days may not otherwise be expected. This results from statistical considerations of the formulae. The annual degree day normals were calculated by adding the corresponding monthly degree day normals.

Supplementary Data

Individual station values (by-month) of average (maximum, minimum, and mean) temperature and total precipitation used to calculate the normals for the 1971-2000 period are available from the National Climatic Data Center, Asheville, NC, and may be obtained in either microfiche or digital media (DSI-9641). In addition, extremes of monthly total precipitation and mean temperature are included, along with the standard deviations of the monthly

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temperatures. The median (i.e., 50th percentile), 11-year and 21-year means are also provided for both temperature and precipitation.

Precipitation normals less than .005 inch are shown as zero. Precipitation includes rainfall and the liquid water equivalent of frozen precipitation (snow, sleet, hail).

Temperature normals are provided for mean monthly maximum temperature (HIGHEST MEAN), mean monthly minimum temperature (LOWEST MEAN), and mean monthly average temperature (NORMAL). The median (50th percentile) monthly average temperature is shown as MEDIAN. The median is the middlemost value in an ordered series of values. Half of the values are greater than the median and half are less than the median. Monthly normals for February are based on a 28-day month. For HIGHEST MEAN and LOWEST MEAN, the year of occurrence is also provided.

Figures and letters following the station name generally indicate a rural location and refer to the distance and direction of the station from the nearest Post Office. WSO, WSMO, WSCMO, WSFO, or WFO denote a National Weather Service office, meteorological observatory, contract meteorological observatory and forecast office. FAA implies a Federal Aviation Administration station with an observing capability coordinated by the National Weather Service. Station elevations are in feet above mean sea level. The December 2000 observation time for temperature is shown on the temperature tables under the station name in local time.

1971-2000 PRECIPITATION PROBABILITIES AND QUINTILES

When historical climate data are accumulated and examined, they generally follow a certain pattern called a statistical distribution. For example, if 30 years of June temperature data were assembled and examined, the data would have a pattern that consisted of most of the Junes having temperatures close to the normal or average value, a few Junes having very warm temperatures, and a few Junes having very cold temperatures. This kind of statistical pattern is called a "Gaussian" distribution. Temperature data typically follow a Gaussian distribution, but precipitation frequently does not. This is because precipitation is zero-bounded. When historical precipitation data are examined, most of the values will be close to the middle of the distribution, and some values will be considerably higher than the middle range. But on the low end of the scale, the smallest values will never be less than zero, since there can't be a negative precipitation. In particularly dry (e.g., desert) regions, the pattern can be drastically skewed to the left-hand side of the scale, with most of the values being near zero and a few very wet values spread far to the right. This kind of pattern is called a "Gamma" distribution. Once the statistical distribution is identified, the statistical properties of the distribution can be used to estimate the probabilities that certain values will occur, and which values can be expected at certain probability levels. The probability levels desired can be preselected at certain individual levels or at regular intervals. The 0-20%, 20-40%, 40-60%, 60-80%, and 80-100% intervals are called the quintile levels.

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In this data set, the Gamma distribution was used to estimate the precipitation values at 15 probability levels (0.005, 0.01, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90, 0.95, 0.99, and 0.995). For example, if 1.77 inches corresponds to the 0.20 probability level, that means that, on average, 2 out of 10 years will have 1.77 inches or less of precipitation in that month. It also means that, on average, 8 out of 10 years will have more than 1.77 inches of precipitation in that month.

The expected precipitation values at the quintile levels are also included. The precipitation quintiles show the expected precipitation values at the five quintile levels for each of the twelve months: 1. First Quintile (0-20%); 2. Second Quintile (20-40%); 3. Third Quintile (40-60%); 4. Fourth Quintile (60-80%); 5. Fifth Quintile (80-100%). For example, if 2.91 and 4.07 inches are the bounds for the second quintile (level 2), then a monthly total precipitation amount for that month falling in the range 2.91 to 4.07 would be classified as a second quintile precipitation amount and that month would be considered relatively dry. Two extreme quintile levels are also computed: Quintile level 0 would be used if a further precipitation observation is less than the 1971-2000 value, while quintile level 6 would be used if the observed value is more than the 1971-2000 maximum.

2. Element Names and Definitions: The data are archived in **five files** of fixed-length ASCII format.

File 1. 1971-2000 MONTHLY NORMALS INVENTORY
(9641C_1971-2000_NORM_CLIM81_MTH_STNMETA)
File 2. 1971-2000 SEQUENTIAL TEMPERATURE AND PRECIPITATION
(9641C_1971-2000_NORM_CLIM81_MTH_SEQUENTIAL)
File 3. 1971-2000 MONTHLY STATION NORMALS
(9641C_1971-2000_NORM_CLIM81_MTH_STNNORM)
File 4. 1971-2000 PRECIPITATION PROBABILITIES
(9641C_1971-2000_NORM_CLIM81_MTH_PRECPROB)
File 5. 1971-2000 PRECIPITATION QUINTILES
(9641C_1971-2000_NORM_CLIM81_MTH_PRECQUIN)

File 1. 1971-2000 MONTHLY NORMALS INVENTORY (9641C_1971-2000_NORM_CLIM81_MTH_STNMETA)

This file contains identification information about the stations for which 1971-2000 monthly normals were calculated.

ELEMENT	WIDTH	POSITION
STATION COOPERATIVE I.D. NUMBER (CD NUMBER)	6	001-006
CODE 1	1	007
CODE 2	1	008
STATION NAME	24	009-032
LATITUDE	5	033-037
BLANK	3	038-040
LONGITUDE	6	041-046
BLANK	3	047-049

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ELEVATION	5	050-054
BLANK	2	055-056
CURRENT OBSERVATION TIME*	4	057-060
STATE ABBREVIATION	2	062-063

Code 1:
- 1 = Temperature only
- 2 = Precipitation only
- 8 = Temperature and Precipitation (No determination of snow)

Code 2:
- 0 = Station has a minimum of ten year-month values for each month.
- 1 = Station has no more than three consecutive year-month values missing for a given month and no more than five overall values missing for a given month.

*Observation Time is provided for temperature stations in the conterminous U.S. only.

STATION COOPERATIVE I.D.: This 6-character station identifier (occasionally referred to as CD or Cooperative Number) is assigned by the National Climatic Data Center (POSITION 1-6). The first two digits refer to state code (Value 01 - 48, 50, 51, 66, 67 and 91). The next four digits refer to Cooperative Network Index Number (0001 - 9999) (Position 1-6).

DATA CODE 1: A one digit code (Position 7) in this column indicates whether a station is a temperature only (1), precipitation only (2), or temperature and precipitation (8). The previous normals (1961-1990) used this column to additionally indicate whether a station had more than 35 months missing in the normals period (blank), whether a station had more than 20 years missing for First-Order stations (#), whether a station reported snowfall only (3), temperature and precipitation (no snowfall) (4), precipitation and snowfall (no temperature), or temperature, precipitation and snowfall (6). These codes are not used in the 1971-2000 normals (Position 7).

DATA CODE 2: A one-digit code in this column indicates whether a station has a minimum of ten year-month values for each month (0), or whether a station has no more than three consecutive year-month values missing for a given month and no more than five overall values missing for a given month (1). These codes correspond to the WMO standard normals definitions of provisional and fully-qualified stations, respectively. The previous normals (1961-1990) used this column to indicate whether there were less than 20 years missing in the observed data with the presence of a one-digit code as described in DATA CODE 1. The column is not used for this purpose in the 1971-2000 normals (Pos. 8).

STATION NAME: An alpha, numeric or combination of both characters which indicate the station's name. Distance/direction addendums generally indicate number of miles and cardinal direction from a U.S. Post Office or centralized location associated with a place (e.g., NORTHPORT 2 W = 2 miles west of Northport Post Office or town center). A number of abbreviations are common, including: STN=Station, AP=Airport, INTL=International, NATL=National,

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RGNL=Regional, METRO=Metropolitan, OBSY=Observatory, UNIV=University, MTN=Mountain, ST PK=State Park, IS=Island, PLT=Plant, EXP=Experiment, REF=Refuge, AFB=Air Force Base, MCAS=Marine Corps Air Station, NAS=Naval Air Station (Position 9-32).

<u>LATITUDE</u>: In degrees and minutes (negative=S'ern hemisphere) (Pos. 33-37).

<u>LONGITUDE</u>: In degrees and minutes (negative=W'ern hemisphere) (Pos. 41-46).

<u>ELEVATION</u>: In whole feet (Pos. 50-54).

<u>CURRENT OBSERVATION TIME</u>: Local Standard Time at current observation time. Refers to temperature stations only. (Pos. 57-60).

<u>STATE ABBREVIATION</u>: The 2-letter U.S. Postal Service abbreviation for states. Territories are assigned the following abbreviations: PR=Puerto Rico, VI=U.S. Virgin Islands, and PI=Pacific Islands (U.S. Pacific Trust Territories) (Pos. 62-63).

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File 2. 1971-2000 SEQUENTIAL TEMP AND PRECIP (9641C_1971-2000_NORM_CLIM81_MTH_SEQUENTIAL)

This file contains the sequential monthly mean maximum, minimum, and average temperature and total precipitation values used to calculate the 1971-2000 monthly station normals.

ELEMENT			WIDTH	POSITION
STATION COOPERATIVE I.D. NUMBER (CD NUMBER)			6	001-006
DATA TYPE CODE *			1	007
YEAR			4	008-011
JANUARY DATA VALUE AND FLAG	)),		7	012-018
FEBRUARY DATA VALUE AND FLAG	*		7	019-025
MARCH DATA VALUE AND FLAG	*		7	026-032
APRIL DATA VALUE AND FLAG	*		7	033-039
MAY DATA VALUE AND FLAG	*	See	7	040-046
JUNE DATA VALUE AND FLAG	/)) **	Note	7	047-053
JULY DATA VALUE AND FLAG	*	Below	7	054-060
AUGUST DATA VALUE AND FLAG	*		7	061-067
SEPTEMBER DATA VALUE AND FLAG	*		7	068-074
OCTOBER DATA VALUE AND FLAG	*		7	075-081
NOVEMBER DATA VALUE AND FLAG	*		7	082-088
DECEMBER DATA VALUE AND FLAG	)-		7	089-095
ANNUAL DATA VALUE AND FLAG			7	096-102

* DATA TYPE CODE WHERE:
1 = MINIMUM TEMPERATURE
2 = MAXIMUM TEMPERATURE
3 = MEAN TEMPERATURE
4 = TOTAL PRECIPITATION

** DATA FIELD IS MADE UP OF VALUE (6 DIGITS) AND A FLAG BIT

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FLAGS:
A = ACCUMULATED AMOUNT. VALUE IS A TOTAL THAT MAY INCLUDE DATA FROM PREVIOUS MONTH OR MONTHS
C = ADJUSTED DATA. THE DATA VALUE IS BETWEEN 3.5 AND 5.0 STANDARD DEVIATION FROM THE MEAN OFFSET WITH RESPECT TO THE DATA FROM THE NEAREST NEIGHBORS.
E,F, or K = ESTIMATED VALUE. ANNUAL VALUE WILL ALSO BE AN ESTIMATED VALUE.
H = SUBJECTIVE HAND-EDITED VALUE.
I = MONTHLY DATA VALUE BASED ON INCOMPLETE TIME SERIES (1-9 DAYS MISSING).
Q = OTHER OBJECTIVE QUALITY-CONTROLLED VALUE.
T = TRACE OF PRECIPITATION (AMOUNT LESS THAN 0.005 INCH AND IS SHOWN AS ZERO).
X = INTERPOLATED VALUE USING NEAREST NEIGHBOR STATIONS

UNITS: Temperature (Degrees and tenths F) Precipitation (Inches and hundredths)

STATION COOPERATIVE I.D.: This 6 character station identifier (occasionally referred to as CD or Cooperative Number) is assigned by the National Climatic Data Center (Position 1-6). The first two digits refer to state code (Value 01 - 48, 50, 51, 66, 67 and 91). The next four digits refer to Cooperative Network Index Number (0001 - 9999) (Position 1-6).

DATA TYPE CODE: Refers to Minimum/Maximum/Mean Temperature or Precipitation (Position 7).

YEAR: This is the year of record (Position 8-11).

MONTHLY DATA VALUE: 12 MONTHLY VALUES and one ANNUAL VALUE.

Each months value consists of 6 digits/positions (Temperature-degrees and tenths F or Precipitation-inches and hundredths) plus 1 digit/position for a Flag Code. Position 12-18 January, Position 19-25 February,..., Position 82-88 November, Position 89-95 December and Position 96-102 an annual Value of 6 digits/positions plus 1 digit/position for a flag code (Position 10-102).
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File 3. 1971-2000 MONTHLY STATION NORMALS (9641C_1971-2000_NORM_CLIM81_MTH_STNNORM)

This file contains the 1971-2000 monthly station normals statistics.

ELEMENT	WIDTH	POSITION
STATION COOPERATIVE I.D. NUMBER (CD NUMBER)	6	001-006
ELEMENT CODE *	1	007
DATA CODE **	2	008-009
JANUARY DATA VALUE AND FLAG)))),	7	010-016
FEBRUARY DATA VALUE AND FLAG *	7	017-023

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MARCH DATA VALUE AND FLAG       *                  7      024-030
APRIL DATA VALUE AND FLAG       *                  7      031-037
MAY DATA VALUE AND FLAG         *      SEE         7      038-044
JUNE DATA VALUE AND FLAG        /)  *** NOTE       7      045-051
JULY DATA VALUE AND FLAG        *      BELOW       7      052-058
AUGUST DATA VALUE AND FLAG      *                  7      059-065
SEPTEMBER DATA VALUE AND FLAG   *                  7      066-072
OCTOBER DATA VALUE AND FLAG     *                  7      073-079
NOVEMBER DATA VALUE AND FLAG    *                  7      080-086
DECEMBER DATA VALUE AND FLAG    *                  7      087-093
ANNUAL DATA VALUE AND FLAG  ))))-                  8      094-101

     * ELEMENT CODE WHERE:  1 = MINIMUM TEMPERATURE
                            2 = MAXIMUM TEMPERATURE
                            3 = MEAN TEMPERATURE
                            4 = TOTAL PRECIPITATION
                            6 = HEATING DEGREE DAYS
                            7 = COOLING DEGREE DAYS
    ** DATA CODE WHERE:
              03 = NUMBER OF ESTIMATED VALUES IN NORMAL PERIOD
              04 = 71-00 NORMAL
              05 = 71-00 STANDARD DEVIATION
              06 = 71-00 MEDIAN
              07 = 80-00 MEAN
              08 = 80-00 STANDARD DEVIATION
              09 = 80-00 MEDIAN
              10 = 90-00 MEAN
              11 = 90-00 STANDARD DEVIATION
              12 = 90-00 MEDIAN
              13 = MAXIMUM MONTHLY VALUE IN NORMAL PERIOD
              14 = YEAR OF OCCURRENCE OF MAXIMUM VALUE
              15 = MINIMUM MONTHLY VALUE IN NORMAL PERIOD
              16 = YEAR OF OCCURRENCE OF MINIMUM VALUE
              17 = PRECIPITATION 10 PERCENTILE (ELEMENT CODE 4 0NLY)
              18 = PRECIPITATION 90 PERCENTILE (ELEMENT CODE 4 ONLY)
              19 = ADJUSTMENT FACTOR FOR ADJUSTING MIN/MAX TEMPERATURE
                   TO MIDNIGHT OBSERVATION TIME (ELEMENT CODES 1 & 2
                   ONLY).  NO ANNUAL VALUE FOR THIS DATA RECORD
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*** Note: DATA FIELD IS MADE UP OF VALUE (6 DIGITS) AND A FLAG BIT, EXCEPT ANNUAL VALUE.

FLAG "+" APPEARS IN MAXIMUM AND MINIMUM RECORDS ONLY AND INDICATES THAT YEAR IS LATEST YEAR OF OCCURRENCE BUT VALUE OCCURRED IN EARLIER YEAR DURING NORMAL PERIOD.

TEMPERATURE UNITS = DEGREES AND TENTHS F (EXCEPT DEGREES AND THOUSANDTHS F FOR STANDARD DEVIATIONS).

PRECIPITATION UNITS = INCHES AND HUNDREDTHS (EXCEPT INCHES AND TEN-THOUSANDTHS

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FOR STANDARD DEVIATIONS).

STATION COOPERATIVE I.D.: This 6 character station identifier (occasionally referred to as CD NUMBER) is assigned by the National Climatic Data Center (POSITION 1-6). The first two digits refer to state code. (Value 01 - 48, 50, 51, 66, 67 and 91). The next four digits refer to cooperative Network Index Number (0001 - 9999) (Position 1-6).

ELEMENT CODE: Refers to Minimum/Maximum/Mean Temperature, Total Precipitation, Heating Degree Days or Cooling Degree Days (Position 7).

DATA CODE: This code indicates what statistical parameter is listed on the record (Position 8-9).

MONTHLY DATA VALUE: 12 MONTHLY VALUES and one ANNUAL VALUE. Each month's value consists of 6 digits/positions (Temperature-degrees and tenths F or Precipitation-inches and hundredths) plus 1 digit/position for a Flag Code. Position 10-16 January, Position 17-23 February,...., Position 80-86 November, Position 87-93 December and Position 94-101 ANNUAL VALUE and FLAG (7 digits/positions Annual value, 1 digit/position Flag Code) (Position 10-101).
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File 4. 1971-2000 PRECIPITATION PROBABILITIES (9641C_1971-2000_NORM_CLIM81_MTH_PRECPROB)

This file contains the Gamma precipitation probabilities (to 15 probability levels).

ELEMENT	WIDTH	POSITION
STATION COOPERATIVE I.D. NUMBER (CD NUMBER)	6	001-006
MONTH *	2	007-008
0.005 PROBABILITY VALUE	6	009-014
0.01 " "	6	015-020
0.05 " "	6	021-026
0.1 " "	6	027-032
0.2 " "	6	033-038
0.3 " "	6	039-044
0.4 " "	6	045-050
0.5 " "	6	051-056
0.6 " "	6	057-062
0.7 " "	6	063-068
0.8 " "	6	069-074
0.9 " "	6	075-080
0.95 " "	6	081-086
0.99 " "	6	087-092
0.995 " "	6	093-098

* MONTH CODES ARE 01-13. MONTH CODE 13 INDICATES AN ANNUAL VALUE.

STATION COOPERATIVE I.D.: This 6-character station identifier (occasionally

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referred to as CD or Cooperative Number) is assigned by the National Climatic Data Center (Position 1-6). The first two digits refer to state code (Value 01 - 48, 50, 51, 66, 67 and 91). The next four digits refer to Cooperative Network Index Number (0001 - 9999) (Position 1-6).

MONTH: This is the month of the record. Range of values is 01-13 (Pos. 7-8).

PROBABILITY VALUE: These precipitation values are the precipitation amounts expected at each of 15 probability levels. (15 precipitation values- 6 digits/positions each- Positions 9-100).
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File 5. 1971-2000 PRECIPITATION QUINTILES (9641C_1971-2000_NORM_CLIM81_MTH_PRECQUIN)

ELEMENT			WIDTH	POSITION
STATION COOPERATIVE I.D. NUMBER (CD NUMBER)			6	001-006
CODE *			1	007
JANUARY DATA VALUE))),			6	008-013
FEBRUARY DATA VALUE	*		6	014-019
MARCH DATA VALUE	*		6	020-025
APRIL DATA VALUE	*		6	026-031
MAY DATA VALUE	*	SEE	6	032-037
JUNE DATA VALUE	/))	** NOTE	6	038-043
JULY DATA VALUE	*	BELOW	6	044-049
AUGUST DATA VALUE	*		6	050-055
SEPTEMBER DATA VALUE	*		6	056-061
OCTOBER DATA VALUE	*		6	062-067
NOVEMBER DATA VALUE	*		6	068-073
DECEMBER DATA VALUE))-			6	074-079
BLANK			1	080

* CODE WHERE: 1 = 30-YEAR MINIMUM MONTHLY PRECIPITATION
2 = 20 % PROBABILITY VALUE
3 = 40 % PROBABILITY VALUE
4 = 60 % PROBABILITY VALUE
5 = 80 % PROBABILITY VALUE
6 = 30-YEAR MAXIMUM MONTHLY PRECIPITATION

These values make up quintile tables that are published in the Climatography of the U.S. No. 81, Supplement No. 1 publication. Each quintile in the table is associated with a range of values. The first (0-20%) quintile consists of the range defined by the minimum (CODE=1) value to the 20% (CODE =2) value. The second (20-40%) quintile consists of the range defined by the 20% (CODE=2) value plus 0.01 inch to the 40% (CODE=3) value. The third (40-60%) quintile consists of the range defined by the 40% (CODE=3) value plus 0.01 inches to the 60% (CODE=4) value. The fourth (60-80%) quintile consists of the range defined by the 60% (CODE=4) value plus 0.01 inch to the 80% (CODE=5) value. The fifth (80-100%) quintile consists of the range defined by the 80% (CODE=5) value plus 0.01 inch to the maximum (CODE=6) value.

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** DATA FIELD IS MADE UP OF VALUE (6 DIGITS)
UNITS: TEMPERATURE (DEGREES AND TENTHS F)
PRECIPITATION (INCHES AND HUNDREDTH

STATION COOPERATIVE I.D.: This 6-character station identifier (occasionally referred to as CD or Cooperative Number) is assigned by the National Climatic Data Center (Position 1-6). The first two digits refer to state code (Value 01 - 48, 50, 51, 66, 67 and 91). The next four digits refer to Cooperative Network Index Number (0001 - 9999) (Position 1-6).

PROBABILITY LEVELS CODE: These code values indicate the 1971-2000 period minimum/maximum value and 20, 40, 60, and 80 percentile values (Position 7).

MONTHLY PRECIPITATION VALUE: 12 monthly precipitation values. Each monthly value consist of 6 digits/positions. Position 8-13 January, Position 14-19 February,..., Position 68-73 November and Position 74-79 December (Pos. 8-79).

3. **Start Date**: 19710101

4. **Stop Date**: 20001231

5. **Coverage**: The USA, including the 50 states and possessions (Puerto Rico, Virgin Islands, and Pacific Islands).

a. Southernmost Latitude: 15S
b. Northernmost Latitude: 72N
c. Westernmost Longitude: 64W
d. Easternmost Longitude: 121E

6. **How to Order Data**:

Ask NCDC's Climate Services about the cost of obtaining this data set.
Phone: 828-271-4800
FAX: 828-271-4876
E-mail: **NCDC.Orders@noaa.gov**

7. **Archiving Data Center**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

8. **Technical Contact**:

National Climatic Data Center
Federal Building
151 Patton Avenue
Asheville, NC 28801-5001
Phone: (828) 271-4800.

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9. Known Uncorrected Problems: None.

10. Quality Statement: The monthly data that were input to the examination and adjustment algorithms had undergone range, climatology, and allowed value checks at the NCDC's Data Operations Branch. Preparation of the normals sequential values was conducted using statistical assessments by NCDC's Scientific Services Division. This data set has undergone extensive quality checks including range checks, estimation of missing data, evaluation of homogeneity, and adjustments of inhomogeneities.

Benign neglect, state of the art processing, and limited money/people resources all contributed toward less than optimum conditions in maintaining integrity of the digital files. Many of these shortcomings are now recognized and efforts continue to upgrade the principal data sets.

11. Essential Companion Datasets: *Climatography of the United States, No. 84* Daily Normals of Temperature, Precipitation, and Heating and Cooling Degree Days, 1971-2000

12. References:

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Appendix A: Sensor Name and Operating Principles

Minimum Temperature and Maximum Temperature

In the beginning years of this data set, liquid-in-glass thermometers were used to measure these elements. This thermometer is a liquid-filled, U-shaped capillary tube with reservoirs at each end. Two floating indicators to mark the highest and lowest temperature that occurred between resetting times. Resetting is supposed to be done every 24 hours at the same clock time.

For approximately 400 stations in this data set (First-Order Stations), temperature values were observed hourly from hygro-thermometers that are part of the Automated Surface Observing System (ASOS). Prior to ASOS, hygrothermometers were used back to the universal installation of hygro-thermometers in the 1960's, when hourly temperatures were observed with psychrometers and thermographs.

Precipitation

The instrument generally in use for this data set was the 8 inch Standard Rain Gauge. Daily precipitation was measured visually to the nearest .01 inch. Occasionally stations used non-standard gauges (4 inch/plastic).

For approximately 400 stations in this data set (First-Order Stations), precipitation was observed hourly from one of two types of recording rain gauges:

Weighing Rain Gauge (pre-ASOS)

The gauge records the weight of a precipitation-collecting bucket via a spring mechanism, connected to a pen, that records on a paper chart. Records precipitation to a hundredth of an inch (0.01").

Tipping Bucket Rain Gauge

The gauge records the number of times in a 5-minute period that a small collecting bucket that holds one hundredth of an inch (0.01") of water is filled, tips over, and empties. The recorded number of tips is telemetered to a collection site.

Appendix B: Additional station information.

Station Location Accuracy

Location accuracy is to the nearest minute of Latitude/Longitude. Elevation accuracy varies from the nearest foot to nearest Topographic Map Contour interval.

Station Observation Schedule

1971-2000 SEQUENTIAL TEMPERATURE AND PRECIPITATION FILE
1971-2000 MONTHLY STATION NORMALS ALL ELEMENTS FILE

The observation schedule varied with station. Some stations (Cooperative Stations) made once-daily readings of daily (24-hour) maximum and minimum temperature and total precipitation in the morning, some in the afternoon, some in the evening, and some at midnight. Other stations (First-Order Stations) had more frequent (hourly) observation schedules and reported daily (24-hour) maximum and minimum temperature and total precipitation on a midnight-to-midnight (calendar) basis.

Station Data Time Averaging

1971-2000 SEQUENTIAL TEMPERATURE AND PRECIPITATION FILE

The data in this data set are sequential year-month values of monthly mean maximum temperature, monthly mean minimum temperature, monthly mean temperature, and monthly total precipitation.

1971-2000 MONTHLY STATION NORMALS ALL ELEMENTS FILE

The data values in this data set are 30-year averages of monthly mean maximum temperature, monthly mean minimum temperature, monthly mean temperature, and monthly total precipitation.

1971-2000 QUINTILE/PRECIPITATION PROBABILITIES FILE

The data values in this data set are monthly quantities of precipitation that meet certain expectation levels based on a Gamma distribution fit of the historical sequential monthly data.

Network Participation

The Cooperative Observer Network was used for this data set, which is comprised of U.S. stations primarily staffed by "cooperative" observers. The vast majority of these observers are volunteers (non-paid, private individuals) for the National Weather Service (NWS). The cooperative stations are augmented by professionally operated NWS stations, also part of the Cooperative Observer Network and located predominantly at airports.

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Geographical Distribution

There were 7937 stations overall (measuring temperature and/or precipitation), of which 5556 recorded temperature. The geographic distribution varied, being least dense in the western U.S., mountainous, and desert areas. Station density over island locations varied considerably.

Station Elevation Statement

Most of the stations had elevations below 1000 meters above sea level. The minimum elevation is -60 meters and the maximum is 3300 meters.

Error Detection and Correction

The data were examined for exposure changes (i.e., changes in location, instruments, observation practices, etc.). For more information see methodology.